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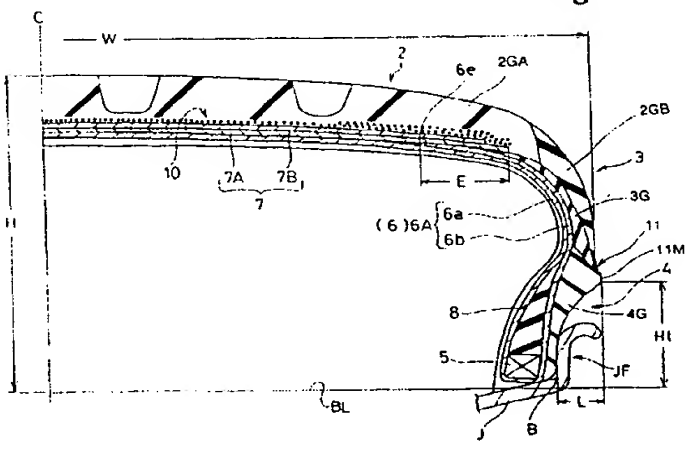
(54) Low-aspect tyre

(57) A pneumatic tyre having an aspect ratio of not more than 55% and comprising: an axially protruding rib (11) provided on each side of the tyre to overhang a flange (JF) of a wheel rim (J); a carcass (6) extending between bead portions (4) through a tread portion (2) and sidewall portions (3); a belt (7) disposed radially outside the carcass (6); a tread rubber (2GA) disposed radially outside the belt (7) to define the ground contacting surface of the tyre; a sidewall rubber (3G) disposed on each side of the tyre and extending from the tread portion to the rib (11) along the axially outside of the carcass; a clinch rubber (4G) disposed on each side of the tyre and extending from the bead portion to the rib (11) along the outer surface of the tyre; and a wing rubber (2GB) disposed axially outside the sidewall rubber (3G) and extending from the tread rubber to the rib (11) along the outer surface of the tyre, the wing rubber (2GB) being softer than the tread rubber. In a tyre meridian section, in a region defined between 45% and 70% of the tyre section height, every boundary line between rubber layers which include the tread rubber (2GA), sidewall rubber (3G), clinch rubber (4G) and wing rubber (2GB) at least, intersects either the outer surface of the tyre or the outside of the carcass.

Fig.1



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Description

[0001] The present invention relates to a pneumatic tyre and more particularly to a low-aspect tyre improved in durability.

[0002] In radial tyres having a low aspect ratio of under 55% especially under 40%, the edges of reinforcing cord layers such as the carcass, belt and the like and the edges of rubber layers such as tread rubber, sidewall rubber, bead apex rubber, clinch rubber and the like are inevitably concentrated in a narrow region, and cracks and separation failure and the like are liable to occur between such layers. Thus, it is difficult to improve the durability of tyre.

[0003] On the other hand, as shown in Fig.12, such low aspect radial tyres are often provided with a part (c) which overhangs a rim flange (JF) of a wheel rim (J) in order to decrease vertical tyre deflections. Fig.12 shows a conventional structure in which: the above-mentioned overhanging part (c) is formed by a relatively hard clinch rubber (d) which is disposed along the axially outer side of the bead portion (b) and extends to a position (e) above the rim flange (JF); a sidewall rubber (i) is disposed along the outer surface of the tyre to extend from position (e) to an axial edge of a belt (f); a tread rubber (g) is disposed radially outside the belt (f); and a wing rubber (h) is disposed over the sidewall rubber (i) in the tyre shoulder.

[0004] In a low-aspect radial tyre having such an overhanging part, bending deformation during running concentrates in the upper sidewall region (y). Therefore, in the conventional structure in which the boundary (k) between the tread rubber (g), wing rubber (h) and sidewall rubber (i) is located in such a region (y), separation failures are especially liable to occur along the boundary (k). Thus, the durability is greatly decreased.

[0005] It is therefore, an object of the present invention to provide a low-aspect tyre in which the tyre durability is improved by effectively preventing damage such as separations, cracks and the like occurred from boundaries between different rubber layers and edges of various layers.

[0006] According to one aspect of the present invention, a pneumatic tyre having an aspect ratio of not more than 55% comprises an axially protruding rib provided on each side of the tyre to overhang a flange of a wheel rim, a carcass extending between bead portions through a tread portion and sidewall portions, a belt disposed radially outside the carcass, a tread rubber disposed radially outside the belt to define the ground contacting surface of the tyre, a sidewall rubber disposed on each side of the tyre and extending from the tread portion to the rib along the axially outside of the carcass, a clinch rubber disposed on each side of the tyre and extending from the bead portion to the rib along the outer surface of the tyre, and a wing rubber disposed axially outside the sidewall rubber and extending from the tread rubber to the rib along the outer surface of the tyre, the wing rubber being softer than the tread rubber.

[0007] Therefore, due to the rib, the rib and part adjacent thereto are increased in rigidity and the deformation thereof during running is decreased. The radially inner ends of the sidewall rubber and wing rubber and the radially outer end of the clinch rubber are positioned near or in the rib. Thus, the stress on the rubber ends can be minimised and separation failures and the like are effectively prevented.

[0008] Embodiments of the present invention will now be described in detail in conjunction with the accompanying drawings:

Fig.1 is a cross sectional view of an embodiment of the present invention;
Fig.2 is an enlarged cross sectional view showing an example of the rib;
Fig.3 is an enlarged cross sectional view showing another example of the rib;
Fig.4 is a cross sectional view of another embodiment of the present invention;
Fig.5 is an enlarged cross sectional view thereof showing still another example of the rib;
Fig.6 is a cross sectional view showing another example of the carcass structure;
Figs.7 to 9 are diagrams for explaining a method of manufacturing tyres according to the present invention;
Fig.10 is a schematic cross sectional view of a strip of integrated tread rubber and wing rubber;
Fig.11 is a schematic cross sectional view of a strip of integrated sidewall rubber and clinch rubber; and
Fig.12 is a schematic cross sectional view of a prior art tyre.

[0009] In the drawings, a radial tyre 1 according to the present invention comprises a tread portion 2, a pair of axially spaced bead portions 4 each with a bead core 5 therein, a pair of sidewall portions 3 extending therebetween, a carcass 6 extending between the bead portions 4, and a belt 7 disposed radially outside the carcass 6 in the tread portion 2.

[0010] The tyre 1 has a relatively low aspect ratio of not more than 55%. In the embodiments shown in Fig.1 and Fig.4, the aspect ratio is not more than 40% and the tyre section height (H) is not more than 100 mm.

[0011] The carcass 6 comprises a ply 6A of cords arranged radially at an angle of from 75 to 90 degrees with respect to the tyre equator C, and extending between the bead portions 4 through the sidewall portions 3 and the tread portion 2, and being turned up around the bead cores 5 from the axially inside to the outside of the tyre to form two turnup portions 6b and a main portion 6a therebetween. For the carcass cords, organic fibre cords, e.g. polyester, nylon, rayon, aromatic polyamide or the like are used.

[0012] In the embodiments shown in Figs.1 and 4, the carcass 6 is composed of a single ply 6A of polyester cords arranged at substantially 90 degrees. The radially outer edges 6e of the turnup portions 6b are disposed between the belt 7 and carcass 6 to prevent ply edge looseness and thereby to improve the durability. The overlap E of each turnup portion 6b with the belt 7 is preferably not less than 5 mm, more preferably 10 to 20 mm.

[0013] Between the main portion 6a and turnup portion 6b in each of the bead portions 4 a bead apex 8, made of a hard rubber compound, is disposed. The bead apex 8 extends and tapers radially outwards from the bead core 5.

[0014] The belt comprises a breaker 7 and optionally a bandage 10 which is disposed radially outside of the breaker 7 to prevent the breaker 7 from being lifted during high speed running.

[0015] The breaker 7 comprises at least two crossed breaker plies 7A and 7B each of parallel cords laid at an angle of from 10 to 45 degrees with respect to the tyre equator. For the breaker cords, steel cords and high elastic modulus organic fibre cords, e.g. aromatic polyamide, aromatic polyester, polyvinyl alcohol, rayon and the like can be used.

[0016] The bandage 10 is made at least one cord the cord angle of which with respect to the circumferential direction is not more than 5 degrees or substantially zero. For the bandage cord, nylon cords are preferably used.

[0017] In the embodiments shown in Figs.1 and 4, the breaker 7 is composed of two breaker plies 7A and 7B each made of steel cords, and the bandage 10 is composed of a full-width ply extending across the full width of the tread and a pair of edge plies each extending in a breaker edge portion.

[0018] The tyre 1 comprises various rubber layers G disposed outside a reinforcing cord structure comprising the above-mentioned carcass 6, belt 7 and bandage 10. By arranging the thickness of such rubber layers G, a rib 11 is formed on each side of the tyre 1.

[0019] The rib 11 has a top surface 11M between a radially outer edge P1 and a radially inner edge P2, a radially outer surface 11U extending radially outwards from the radially outer edge P1, and a radially inner surface 11L extending radially inwards from the radially inner edge P2.

[0020] The radially inner surface 11L is defined by a concave arc having a radius R1, and the outer surface 11U is defined by a concave arc having a radius R2 which is more than the radius R1.

[0021] Preferably, the radial distance L between the radially outer edge P1 and inner edge P2 is in the range of from 4 to 10 mm.

[0022] The overhang L of the rib 11 is set in a range of not less than 10%, preferably 10 to 20%, more preferably 10 to 15% of the tyre section height H. The overhang L is defined as the axial distance between the radially inner edge P2 and the bead heel point B. If the overhang L is less than 10%, the bending rigidity of the bead portions 4 can not be effectively increased, and the steering stability and the like are deteriorated.

[0023] In the present invention, various sizes were measured under an unloaded standard condition in which the tyre is mounted on the standard rim and inflated to a standard inner pressure but loaded with no tyre-load. The standard rim is the "standard rim" specified in JATMA, the "Measuring Rim" in ETRTO, the "Design Rim" in TRA or the like. The standard pressure is the "maximum air pressure" in JATMA, the "Inflation Pressure" in ETRTO, the maximum pressure given in the "Tyre Load Limits at Various Cold Inflation Pressures" table in TRA or the like. However, in case the tyre is for passenger cars, the standard pressure is 180 KPa. The radial height or heights referred in this specification are measured radially from the bead base line BL. The bead base line BL is an axial line passing through a radial height corresponding to the rim diameter of the wheel rim. The bead heel point B is an intersecting point between the bottom line of the bead portion and the axially outer surface line of the bead portion.

[0024] The above-mentioned rubber layers G include: a tread rubber 2GA disposed radially outside the belt 7 to define the ground contacting face; a sidewall rubber 3G disposed in each of the sidewall portions 3 along the axially outside of the carcass 6; a wing rubber 2GB disposed on the axially outside of each sidewall rubber 3G and extending from one of the axial edges to the rib 11 to define the axially outer surface of the sidewall portion 3; and a clinch rubber 4G disposed in each of the bead portions 4 and extending from the bead base to the above-mentioned rib 11 along the outside of the carcass 6 to define the axially outer surface of the bead portion. When the above-mentioned bead apex rubber 8 is completely wrapped in the carcass ply turnup portion, it is not included in the rubber layers G. When it is not wrapped completely as shown in Fig.6, the bead apex rubber 8 is included. In the embodiments shown, the bead apex rubber 8 extends radially outwardly from the bead core 5 beyond the rib 11, but ends before the above-mentioned region Y.

[0025] In a tyre meridian section, a region Y (see Fig.4) defined between 45% and 70% of the tyre section height H is a region where stresses and strains are very high. Therefore, the rubber layers G are arranged such that, in this region Y, every boundary line K between the rubber layers G does not intersect either the outer surface of the tyre or the outside of the carcass 6. Thereby, damages such as cracks, separations and the like starting from intersecting points can be effectively controlled and the durability is improved.

[0026] Such boundary lines K may include: a boundary line between the tread rubber 2GA and sidewall rubber 3G; a boundary line between the tread rubber 2GA and wing rubber 2GB; a boundary line K1 between the wing rubber 2GB and sidewall rubber 3G; a boundary line K2 between the clinch rubber 4G and sidewall rubber 3G; and a boundary line between the clinch rubber 4G and wing rubber 2GB.

[0027] For the clinch rubber 4G, a hard rubber compound having a strong resistance to abrasion is used. The sidewall rubber 3G is softer than the clinch rubber 4G and a rubber compound having flexibility and a good adhesive property to the wing rubber 2GB is used. For the tread rubber 2GA, a relatively hard rubber compound having a superior wear resistance is used. The wing rubber 2GB is softer than the tread rubber 2GA and a rubber compound superior in adhesive property to the sidewall rubber 3G is used. As the rubbers 2GA, 2GB, 3G and 4G are different rubber compounds, generally they have different physical properties such as hardness and the like.

[0028] As the wing rubber 2GB is exposed to the outside of the tyre, the rubber compound for the wing rubber preferably includes Ethylene-Propylen-Dien-Monomer (EPDM) for its excellent weather resistance, ozone crack resistance, light resistance and adhesive property. The iodine value of the EPDM is preferably set in a range of from 10 to 15 to improve the adhesive property. Further, in view of cut resistance, the rubber compound for the wing rubber 2GB preferably includes natural rubber and polybutadiene polymer. Furthermore, the acetone extraction of the wing rubber 15 is preferably set in a range of not more than 10%.

[0029] On the other hand, as the sidewall rubber 3G is not exposed to the outside of the tyre, it is possible to use a relatively low grade rubber. for example: a high-oil rubber compound whose acetone extraction is more than 10% but not more than 20%; a rubber compound including at least 10 parts by weight of inorganic extender filler, e.g. calcium carbonate, magnesium carbonate or the like, with respect to 100 parts by weight of rubber component; a rubber compound including at least 30 parts by weight of styrene butadiene rubber; a rubber compound including GPF carbon as the reinforcing and bulking agent. Thus, the tyre cost can be reduced.

[0030] The above-mentioned acetone extraction is measured according to Japanese Industrial Standard K6350-6.2 as follows. First, the rubber is chopped, and the weight W1 thereof is measured. The chopped rubber is soaked in acetone solvent for eight hours. Then the weight W2 of the chopped rubber is again measured after being dried for thirty minutes at a temperature of 70 to 80 degrees C. The acetone extraction is obtained by the following equation:

$$(1-W2/W1)X100 \quad (\%)$$

Figs.1, 2 and 3 show examples in which the sidewall rubber 3G is not exposed, and Figs.4, 5 and 6 show examples in which the sidewall rubber 3G is exposed.

[0031] In Figs.1 and 2, the sidewall rubber 3G extends from the belt edge near to but slightly radially outwards of the top (11M) of the rib 11. The radially outer end of the sidewall rubber 3G is secured between the belt 7 and carcass 6.

[0032] The wing rubber 2GB extends from a position axially outside the belt edge to substantially the same position as the radially inner end of the sidewall rubber 3G, and the radially inner end 15e thereof reaches to the clinch rubber 4G. Accordingly, the sidewall rubber 3G is completely covered by the wing rubber 2GB.

[0033] As shown in Fig.2, preferably the radially inner end U1 of the wing rubber 2GB is located at an axial distance N of not less than 2 mm from the edge P1 of the rib top. If the distance N is less than 2 mm, separation and damage are liable to occur at the end U1 when the tyre sidewall comes into collision with curbs and the like.

[0034] In this embodiment, the radial height Ht measured from the bead base line BL to the top of the rib 11 is not more than 40%, preferably, from 20 to 30% of the tyre section height H.

[0035] The rib top surface 11M shown in Figs.1 and 2 is flat, but it is also possible to form another shape.

[0036] In Fig.3, the rib top surface 11M has a concave part or a circumferentially continuous groove 20, and the radially inner end or edge U1 of the wing rubber 2GB is positioned in the centre of the groove bottom so as to provide the above-mentioned axial distance N of not less than 2 mm. The radially inner end of the sidewall rubber 3G is positioned at substantially the same position as the end U1 of the wing rubber 2GB.

Comparison Tests:

[0037] Test tyres of size 225/35ZR17 were prepared and tested for durability and steering stability as follows. The specifications thereof and test results are shown in Table 1.

Durability Test:

[0038] Using a tyre test drum, the running distance until any damage was found was measured under the following conditions. In Table 1, the marked distance is indicated as a percentage of Max. running distance of 60 km.

Wheel rim size: 17X8J
Inner pressure: 300 KPa
Vertical tyre load: 875 kgf
Speed: 60 km/h

Steering stability Test:

[0039] A test driver ran a test car on a dry asphalt road on a tyre test course and, by the driver's feelings, handling response, rigidity, grip and the like were evaluated into ten ranks, wherein the higher the value the better the stability.

Table 1

Tyre	Ex.11	Ex.12	Ref.11	Ref.12	Ref.13	Ref.14	Ref.15
Structure	Fig. 1	Fig. 1	Fig.11	Fig.11	Fig.11	Fig.11	Fig.11
Section height H (mm)	76	76	76	76	76	76	76
Carcass Number of ply	1	2	1	2	2	2	1
Turnup height (mm)	*1	45&20	45	45&20	20&10	*1	*2
Test Results	100	100	80	80	90	90	90
Durability Steering stability	6	6	5	6	4	6	2

*1: The turnup portions were disposed between the belt and carcass, and the overlap with the belt was 15 mm.

*2 The turnup portions were disposed between the belt and carcass, and the overlap with the belt was 10 mm.

[0040] In Fig.4, 5 and 6, the sidewall rubber 3G is exposed as mentioned-above.

[0041] The sidewall rubber 3G extends from the belt edge to the top of the rib 11. The wing rubber 2GB also extends to the top of the rib 11.

[0042] On the tyre outer surface, the boundary K1 between the wing rubber 2GB and sidewall rubber 3G is positioned in the centre of the rib top (11M) which is formed as a concave shape for the same reason as the former example. In this case, however, it is not always necessary to adjust the axial distance N to a relatively large distance because of good adhesion therebetween and the flexible sidewall rubber. In this example, the top surface 11M of the rib 11 is defined as a concave arc having a radius of curvature R3 of from 5 to 30 mm.

[0043] Further, as shown in Fig.5, the boundary line K2 between the sidewall rubber 3G and the clinch rubber 4G, intersects the tyre outer surface at a point U2 on the radially inner surface 11L of the rib 11, and also intersect the outside of the carcass 6 at a point V2 positioned radially inside of the region Y.

[0044] The radial height H1 measured from the bead base line BL to the outer edge P1 is not more than 45% of the tyre section height H.

[0045] The total rubber thickness T1 measured at the radially outer edge P1 along the axial direction between the tyre outer surface and the carcass ply turnup portions 6b is in the range of from 3 to 12 mm, preferably 4 to 8 mm.

[0046] If the height H1 is more than 45% of the height H, or the rubber thickness T1 is more than 12 mm, the rigidity of the sidewall portions 3 excessively increases and the steering stability, handling response and the like deteriorate. If the rubber thickness T1 is less than 3 mm, deformation increases on the radially outer surface of the rib 11 and the steering stability and bead durability decrease.

[0047] Fig.6 shows a modification of the carcass 6, wherein the carcass ply turnup portions 6b terminates radially inside the radially outer end 8e of the bead apex rubber 8. In a tyre meridian section, the boundary line K3 between the sidewall rubber 3G and bead apex rubber 8, intersects the outside 6S of the carcass 6 at a point V3 which is located radially inside the region Y.

Comparison Test:

[0048] Test tyres of size 275/35ZR18 were prepared and tested for durability under the following conditions. The specifications of the tyres and test results are shown in Table 2.

Wheel rim size: 10.5JX18
Inner pressure: 230 KPa
Vertical load: 510 kgf
Running speed: 60 km/h

Table 2

Tyre	Ex. 21	Ex. 22	Ex. 23	Ex. 24	Ex.25	Ex.26	Ex.27	Ex.28	Ex.29	Ref. 21	Ref. 22	Ref. 23
Structure	Fig. 4	Fig. 4	Fig. 4	Fig.4	Fig.4	Fig.4	Fig.4	Fig.4	Fig 4	Fig.4	Fig 4	SOT*
Section height H (mm)	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5
Rib 11 Length L (mm)	7	7	non -	7	7	4	10	10	10	10	10	non -
P1 height (mm)	37	37	-	37	37	37	37	37	37	37	37	-
U1 height (mm)	32.5	40	32.5	32.5	32.5	32.5	32.5	32.5	32.5	55	65	-
Radius R1 (mm)	20	20	-	20	20	20	20	20	20	20	20	-
Radius R2 (mm)	45	45	-	45	45	45	45	45	45	45	45	-
Radius R3 (mm)	15	15	-	15	15	15	15	10	30	30	30	-
Thickness T1 (mm)	9	9	-	3	12	9	9	9	9	9	9	-
Durability	123	102	107	112	125	118	123	123	121	83	95	100

*) SOT: Sidewall rubber disposed over tread in tyre shoulder rubber

[0049] Next, according to Figs.7 to 9, a method of manufacturing the tyre according to the invention will be described.

[0050] The tyre is built up, using a tyre building drum 20 which is expandable from a cylindrical contracted state to a toroidal shape.

[0051] As shown in Fig.7, the carcass ply 6A is wound around the cylindrical tyre building drum 20 on which an inner liner rubber (not shown) is applied beforehand, and the bead cores 5 and bead apex rubber 8 are set. Then, both ends of the carcass ply 6A are folded on to the central portion to form the carcass ply turnup portions 6b.

[0052] Next, the clinch rubber 4G and sidewall rubber 3G are wound onto the drum preferably as an integrated strip S of clinch rubber and sidewall rubber as shown in Fig.II. This improves the dimensional accuracy and the efficiency of work. The integration of the rubber is made by means of an extruder.

[0053] The above steps are made with the drum 20 in the cylindrical contracted state.

[0054] Next, the drum 20 is expanded, for example by inflating a bladder 24, while decreasing the distance between the bead portions as shown in Fig.8. Thus, the above-mentioned cylindrical assembly 21 is transformed into a toroidal body 22.

[0055] In this state, a tread ring 23 is put around the toroidal body 22 as shown in Fig.9. The tread ring 23 is an annular assembly of the tread rubber 2GA, wing rubber 2GB, belt 7 and band 9. To make the tread ring 23, first the tread rubber 2GA and wing rubber 2GB are united into a strip T by means of an extruder, and then the assembly is wound on another drum around which the belt 7 and band 10 are wound in advance.

[0056] The wing rubber 2GB is applied to the toroidal body 22. Thus the raw tyre is made.

[0057] Finally, the raw tyre is put in a mould and vulcanised.

Claims

1. A pneumatic tyre having an aspect ratio of not more than 55% and characterised by an axially protruding rib (11) provided on each side of the tyre to overhang a flange (JF) of a wheel rim (J), a carcass (6) extending between bead portions (4) through a tread portion (2) and sidewall portions (3), a belt (7) disposed radially outside the carcass (6), a tread rubber (2GA) disposed radially outside the belt (7) to define the ground contacting surface of

the tyre, a sidewall rubber (3G) disposed on each side of the tyre and extending from the tread portion to the rib (11) along the axially outside of the carcass (6), a clinch rubber (4G) disposed on each side of the tyre and extending from the bead portion to the rib (11) along the outer surface of the tyre, a wing rubber (2GB) disposed axially outside the sidewall rubber (3G) and extending from the tread rubber to the rib (11) along the outer surface of the tyre, the wing rubber (2GB) being softer than the tread rubber.

2. A pneumatic tyre according to claim 1, characterised in that in a tyre meridian section, in a region defined between 45% and 70% of the tyre section height, every boundary line between rubber layers which include said tread rubber (2GA), sidewall rubber (3G), clinch rubber (4G) and wing rubber (2GB) at least, intersects either the outer surface of the tyre or the outside of the carcass.

3. A pneumatic tyre according to claim 2, characterised in that on the outer surface of the tyre, every boundary between said rubber layers is positioned at a distance (N) from the axially extreme end of the rib.

4. A pneumatic tyre according to claim 1, 2 or 3, characterised in that said tyre section height is not more than 100 mm.

5. A pneumatic tyre according to claim 1, 2, 3 or 4, characterised in that the wing rubber (2GB) is a rubber compound which includes Ethylene-Propylen-Dien-Monomer and of which acetone extraction is not more than 10%, and the sidewall rubber (3G) is a rubber compound of which acetone extraction is more than 10% but not more than 20%.

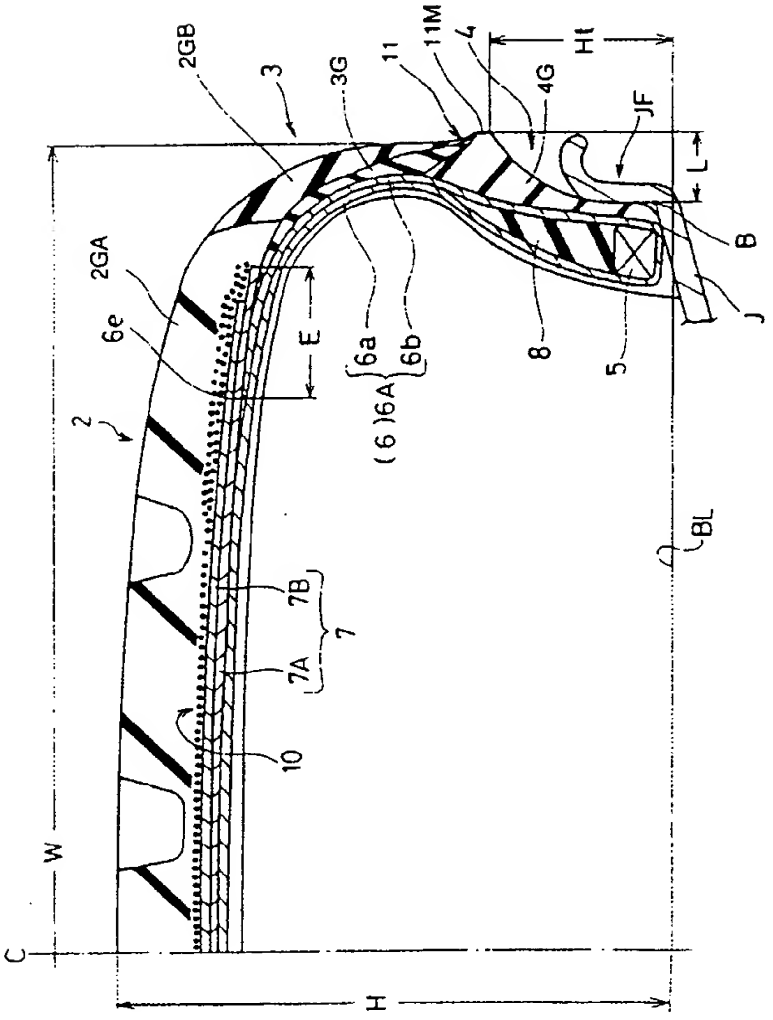
6. A pneumatic tyre according to claim 1, 2, 3, 4 or 5, characterised in that the carcass (6) is composed of a single ply extending between the bead portions and turned up around a bead core (5) in each bead portion from the inside to the outside of the tyre to form a pair of turnup portions (6B) and a main portion (6A) therebetween, and the radially outer ends of the turnup portions are secured between the carcass (6) and the belt (7).

7. A pneumatic tyre according to claim 1, 2, 3, 4, 5 or 6, characterised in that the radially outer end of the sidewall rubber (3G) is secured between the carcass (6) and the belt (7).

8. A pneumatic tyre according to one of the preceding claims, characterised in that the sidewall rubber (3G) is not exposed to the outside of the tyre.

9. A pneumatic tyre according to one of the preceding claims, characterised in that the wing rubber (2GB) has a radially inner edge (UI) positioned in a concave part (20) which is provided on a top of the rib.

Fig.1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3G
11
11M
4
Ht
4G
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B
J
2GA
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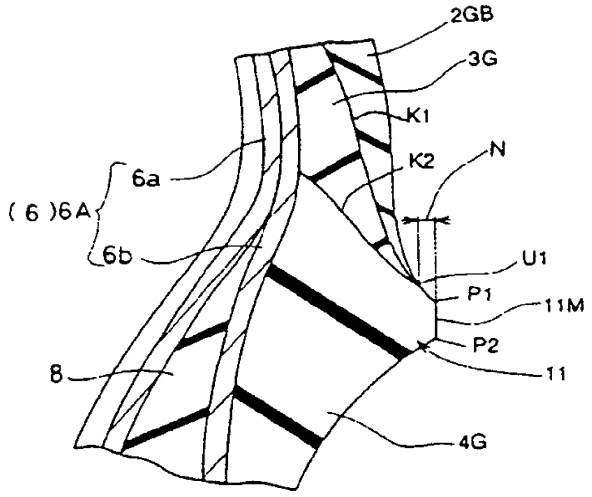
7B
7
7A
10
W
C
H

Fig.2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P2
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8
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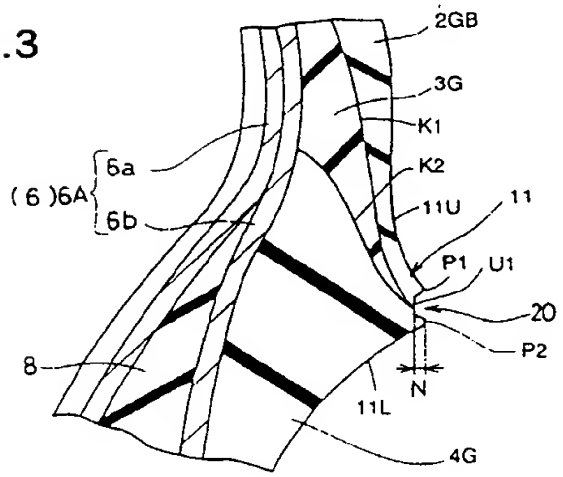
Fig.3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6b
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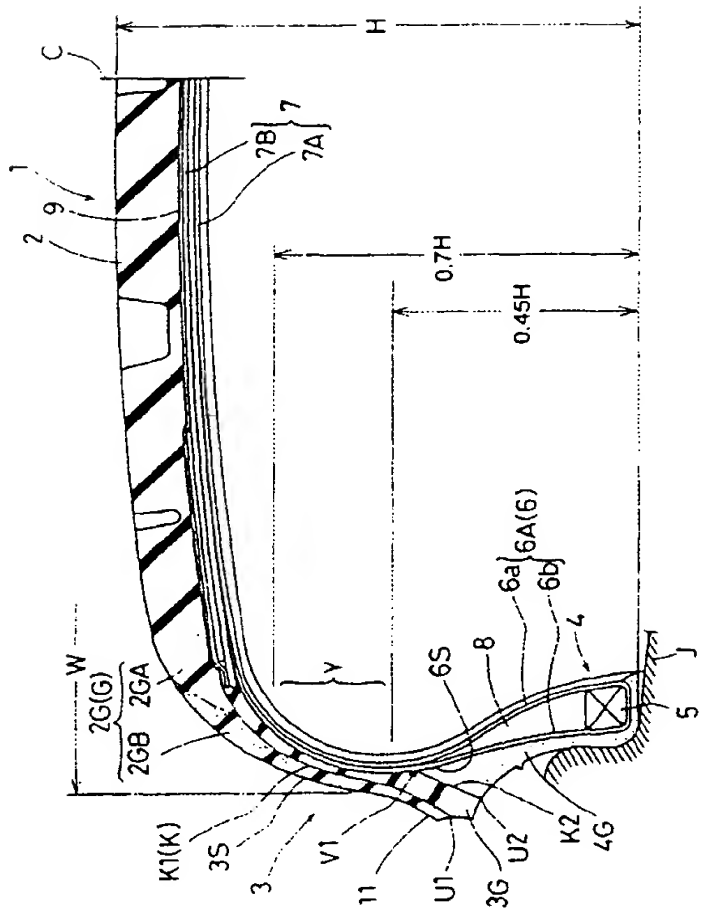
11
P1
U1
20
P2
8
N
11L
4G

Fig.4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9
2
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6a
6b
4
8
6S
J
5
W
2G(G)
2GA
2GB
Y
K1(K)
3S
3
V1
11
U1
3G
U2
K2
4G

Fig.5

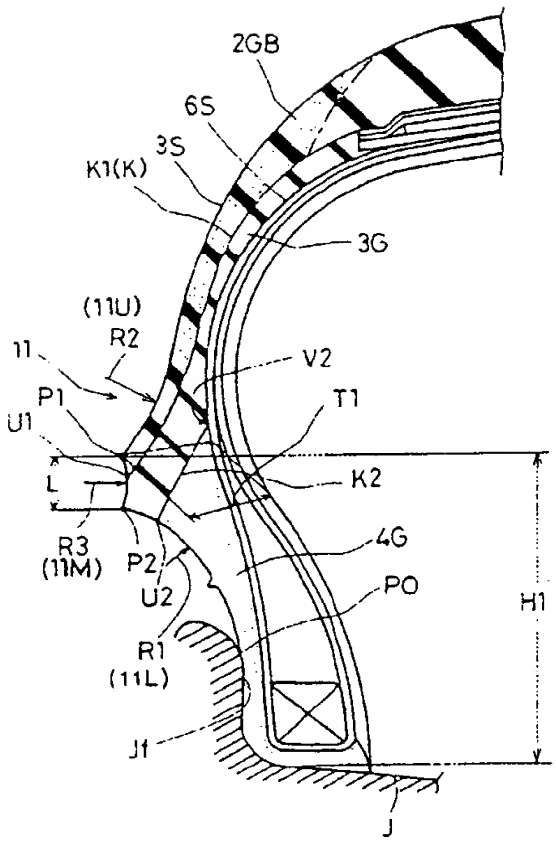

2GB
6S
3S
K1(K)
3G
(11U)
R2
11
V2
P1
T1
U1
K2
L
4G
R3
(11M)
P2
U2
PO
H1
R1
(11L)
J1
J

Fig.6

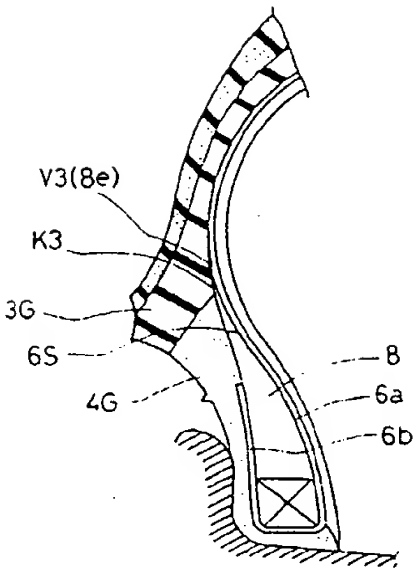


Fig.7

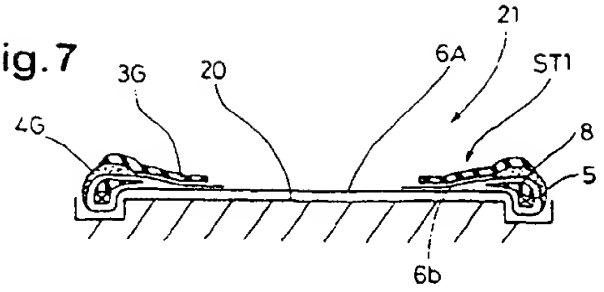


Fig.8

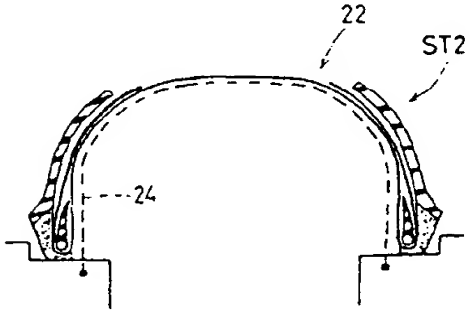
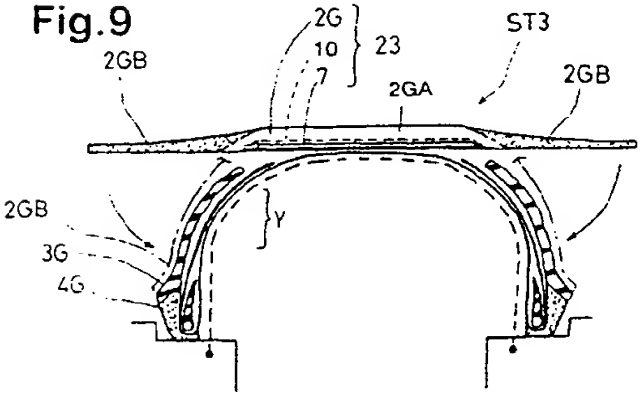


Fig.9



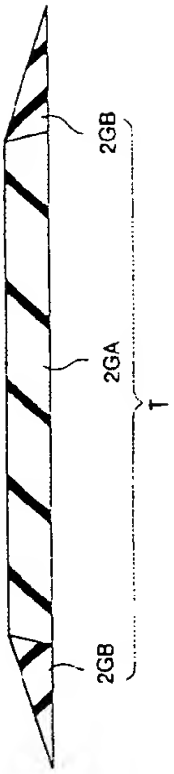


Fig.10

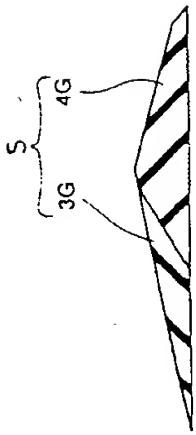
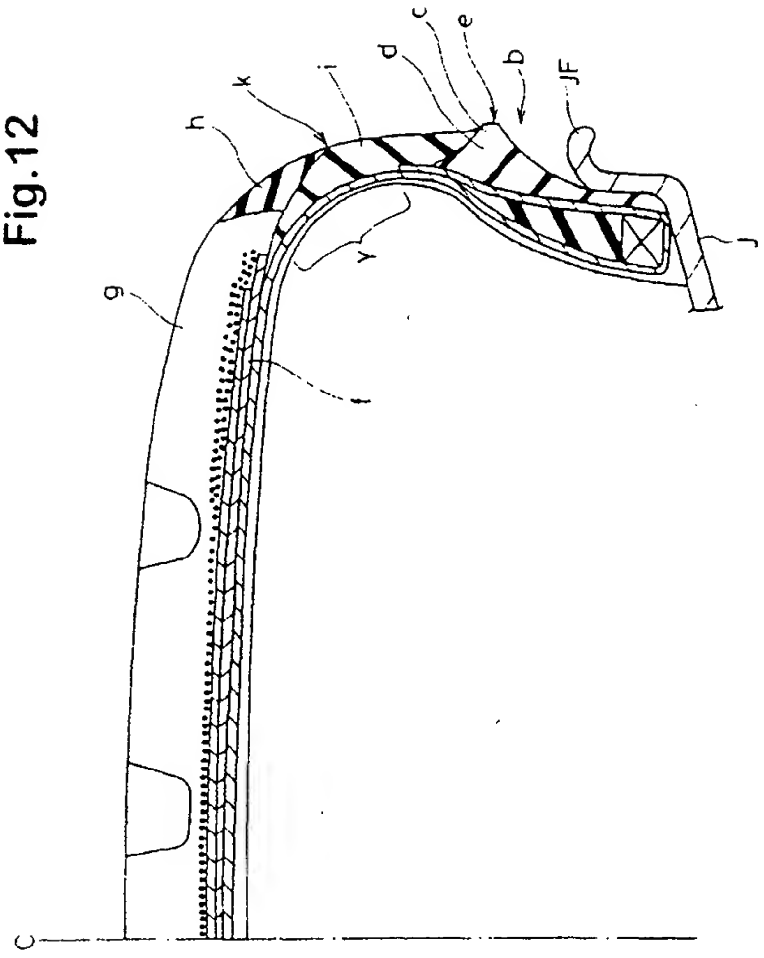


Fig.11

Fig.12



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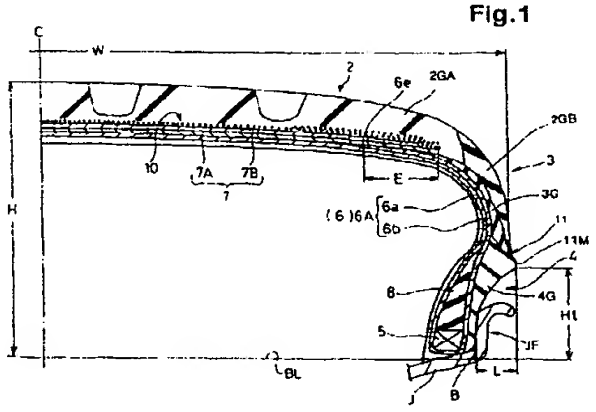
(54) Low-aspect tyre

(57) A pneumatic tyre having an aspect ratio of not more than 55% and comprising: an axially protruding rib (11) provided on each side of the tyre to overhang a flange (JF) of a wheel rim (J); a carcass (6) extending between bead portions (4) through a tread portion (2) and sidewall portions (3); a belt (7) disposed radially outside the carcass (6); a tread rubber (2GA) disposed radially outside the belt (7) to define the ground contacting surface of the tyre; a sidewall rubber (3G) disposed on each side of the tyre and extending from the tread portion to the rib (11) along the axially outside of the carcass; a clinch rubber (4G) disposed on each side of the tyre and extending from the bead portion to the rib (11) along the outer surface of the tyre; and a wing rubber (2GB) disposed axially outside the sidewall rubber (3G) and extending from the tread rubber to the rib (11) along the outer surface of the tyre, the wing rubber (2GB) being softer than the tread rubber. In a tyre meridian section, in a region defined between 45% and 70% of the tyre section height, every boundary line between rubber layers which include the tread rubber (2GA), sidewall rubber (3G), clinch rubber (4G) and wing rubber (2GB) at least, intersects either the outer surface of the tyre or the outside of the carcass.

Fig.1



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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 4160

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Place of search	Date of completion of the search	Examiner
MUNICH	23 November 2001	Peschel, W

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